CLAIMS

What is claimed is:

1. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that delivers a current of 1000 amps (A) or greater to the drawn arc stud applying device, the processing circuit including an inverter having at least one double-sided cooled switching semiconductor.

2. A stud welder apparatus as recited in claim 1, wherein the inverter includes double-sided cooled secondary side diode semiconductors.

3. A stud welder apparatus as recited in claim 1, wherein the switching semiconductor comprises double-sided cooled primary side SCR semiconductors.

4. A stud welder apparatus as recited in claim 1, wherein the processing circuit delivers the current in short intervals of approximately 0.20 to 1.2 seconds for applying studs.

5. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that provides a constant power to the drawn arc stud applying device, the processing circuit including an inverter having at least one double-sided cooled switching semiconductor.

6. A stud welder apparatus as recited in claim 5, wherein the processing circuit maintains the frequency constant to provide the constant power.

7. A stud welder apparatus as recited in claim 5, wherein the processing circuit measures the current, multiplies the current and voltage, and adjusts the current to provide the constant power.

8. A stud welder apparatus as recited in claim 5, wherein the processing circuit measures the voltage, multiplies the current and voltage, and adjusts the voltage to provide the constant power.

9. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that measures the progress of making the stud and stops a supplying of current to the stud applying device if the progress indicates that the stud will not receive sufficient energy at the end of the stud process in sufficient time that the stud making process can be stopped before an unacceptable stud has been created.

10. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that continuously measures the degree of melting off when making the stud and stops delivery of energy to the stud applying device if the melting off progress indicates that the stud will not receive sufficient energy at the end of the stud process in sufficient time that the stud process can be stopped before an unacceptable stud has been created by pulling back the stud before a molten stud has cooled down.

11. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that, after the current starts to be delivered, increases the arc length caused by current melting of the stud, and moves the stud towards a base metal to be welded with a speed equal to the stud melting speed, thereby keeping the arc length constant by measuring the arc voltage and regulating the position of the stud to achieve a constant set arc voltage.

12. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that measures the resistance of the stud, cables and gun without an arc voltage, the circuit delivering a reduced current of

approximately 10 amps while the stud in the gun touches a base metal to be welded, measuring the resistance before the arc is established, calculating arc voltage, and controlling the movement back of the stud to achieve the desired arc voltage.

13. A stud welder apparatus according to claim 1, wherein the processing circuit increases the current with a controlled rate.

14. A stud welder apparatus according to claim 1, wherein the processing circuit decreases the current with a controlled rate.

15. A stud welder apparatus as recited in claim 1, wherein the processing circuit includes a high voltage generator and wherein the processing circuit applies a voltage at approximately the same time as a spark from the gun to penetrate an insulating layer on a base to be stud welded and to create a conductive path for the stud current.

16. A stud welder apparatus as recited in claim 15, wherein the processing circuit, starting from the start of the stud process with the arc length and not touching a base metal to be welded with a stud, delivering a voltage spike powerful enough to make a spark between the tip of the stud and base metal to be welded.

17. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that measures energy at regular time intervals, extrapolates a forecasted ending energy based upon a predetermined energy, and adjusts at time intervals a current to the stud applying device so that the ending energy is correct.

18. A stud welder apparatus as recited in claim 17, wherein the processing circuit calculates by extrapolation total energy that will be delivered after the stud process is completed by calculating continuously during the stud process an accumulated watt seconds per accumulated millisecond and continuously adjusting the current so as to arrive at a total desired watt seconds when the stud process is terminated.

19. A stud welder apparatus comprising:

a drawn arc stud applying device; and

a drawn arc stud processing circuit that stores energy during periods of no stud current and discharges the energy during a time period when current is needed to apply the stud.